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“Muddling Through”*

a legislative review examining the ability of the New York City water system to meet the demands of Southeastern New York in the 21st Century with recommendations.

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DIVISION OF ENVIRONMENTAL PROTECTION

By Senator Frank Padavan, Chairman
New York State Senate Committee on Cities

July 1988

* "One possible route for future water supply matters is, of course, simple continuation of existing arrangements, in which local water suppliers are responsible for their own needs. . . . This 'solution,' of 'muddling through,' would minimize immediate costs. . . but could prove disastrous."

-- 1973 Report of the Temporary State Commission
on the Water Supply Needs of Southeastern New York.

News from the Senate Committee on **Cities**

Senator Frank Padavan, Chairman

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For Release:
Thursday, July 28, 1988

FUTURE NYC WATER SHORTAGES REMAIN A THREAT, PADAVAN REPORTS

New York may never suffer a drought as devastating as that experienced this year in the Midwest, but serious water shortages in the New York Metropolitan Region are an annual and mounting threat, according to Sen. Frank Padavan, (R-C, Queens Village).

"The question is -- are we better prepared to cope with a drought today than we were in 1965, 1980 or 1985?

"Regretably, the answer is no, declared Padavan, Chairman of the Senate Committee on Cities. The Queens Senator today released his study on the ability of the nation's largest water system to meet the demands of the 21st Century.

The report was titled "Muddling Through," Padavan explained, "because that's how we've responded to a growing water supply shortage for two decades."

Key to the precarious balance of the water supply serving New York City and Mid-Hudson localities is the fact that demand normally exceeds supply by 200 million gallons daily, Padavan pointed out. Total system storage capacity is 500 billion gallons, but the capacity has remained unchanged since 1964, while demands on the system have risen 25 percent.

Among the recommendations made by the Padavan report are:

- * Thoroughly exploring the use of the deactivated Brooklyn-Queens Aquifer as an additional water source. Engineering studies project that 50 million gallons could be drawn from the aquifer every day for 15 months with no ill effects. The aquifer could be recharged with fresh water during the periods when reservoirs are at capacity;

- * A new method of determining water rates is needed to protect low and fixed-income homeowners of the five boroughs. Projections indicate that the combination of debt service and operating costs could result in an unprecedented leap in water and sewer charges over the next 15 years.

Padavan noted that New York City has established an Intergovernment Task Force for planning purposes.

"As Mid-Hudson watershed counties anticipate their own growing water needs, regional cooperation becomes more important. Not only is a regional approach needed to protect water quality, but to solve the problems of supply and demand.

"Establishing a permanent regional inter-governmental panel deserves serious consideration," Padavan said.

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. . . A Message from the Chairman,

In light of New York's extraordinary water resources -- average annual rainfall of 40 inches, one of the world's largest aquifers -- we would seem naturally immune from the effects of drought.

However, twice in this decade droughts have restricted residential and commercial water use as the levels of reservoirs capable of storing 550 billion gallons of water plummeted.

The lesson that should have been understood from the 1980 and 1985 water shortages, is that the vast New York City Water System is in trouble. Under current normal operating conditions, daily demand exceeds safe supply by 200 million gallons.

Today, citizens of Southeastern New York are more vulnerable to a drought-induced water shortage than they have been in nearly 25 years.

With proper management of our rich water resources, we can enjoy an abundant supply of pure water today, tomorrow and into the next century. However, as this report makes clear, decades have been wasted in preparing one of the world's largest fresh water systems for the demands of the 21st Century.

As a result of the Cities Committee October 16, 1987 hearing and subsequent study, our findings include the following:

- * The vulnerability of reservoirs to contamination as a result of development in the watershed regions, as well as the added demand on the system, present powerful arguments for stronger inter-government regional cooperation;

- * Reliance on the Hudson River and high-flow skimming as a back-up fresh water source must be questioned in light of the potential effect that skimming might have on the river's estuarine ecology, including migration of the salt line;

- * The potential for use of the Brooklyn-Queens aquifer through artificial recharge must be thoroughly explored in light

of evidence that 22 billion gallons could be drawn over a 15-month period with no ill effects;

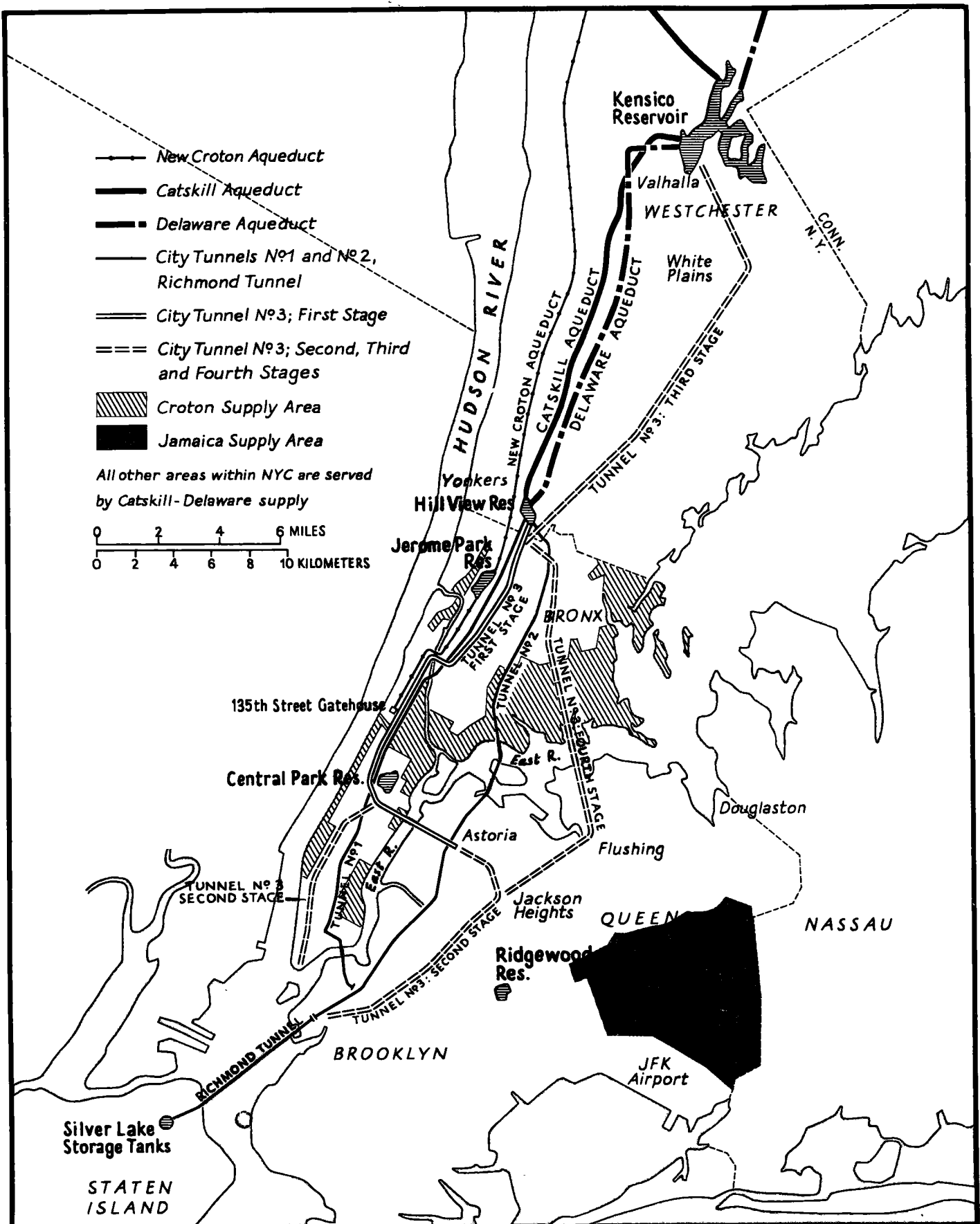
* A new method of setting water rates must be developed in order to prevent low and limited income homeowners in New York City from bearing a disproportionate share of system-wide water costs; and,

* The conservation measures included in the Water Savings Fixture Law of 1979 (Chapter 1979) must be rigorously enforced.

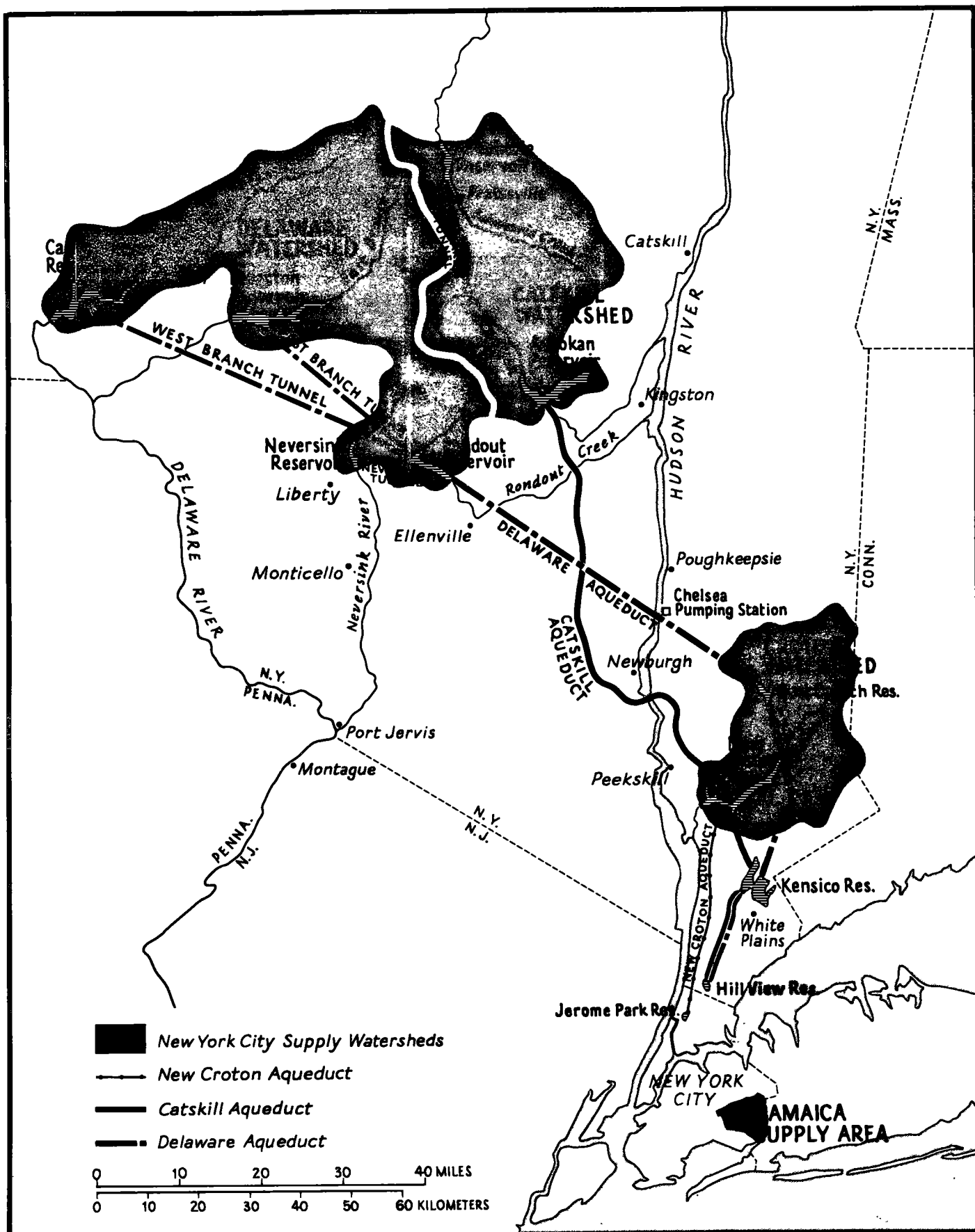
A study of the past and examination of the current state of the New York City water storage and distribution system leads one to conclude that proper management can insure the quantity and quality of pure and fresh drinking water well into the future.

However, failure to plan for future demands on the system -- "muddling through" as authorities have in the past -- exposes New York's water supply to unprecedented risks. It would not be inconceivable that some day New Yorkers might face the dilemma of the Ancient Mariner -- "Water, water everywhere; and not a drop to drink."

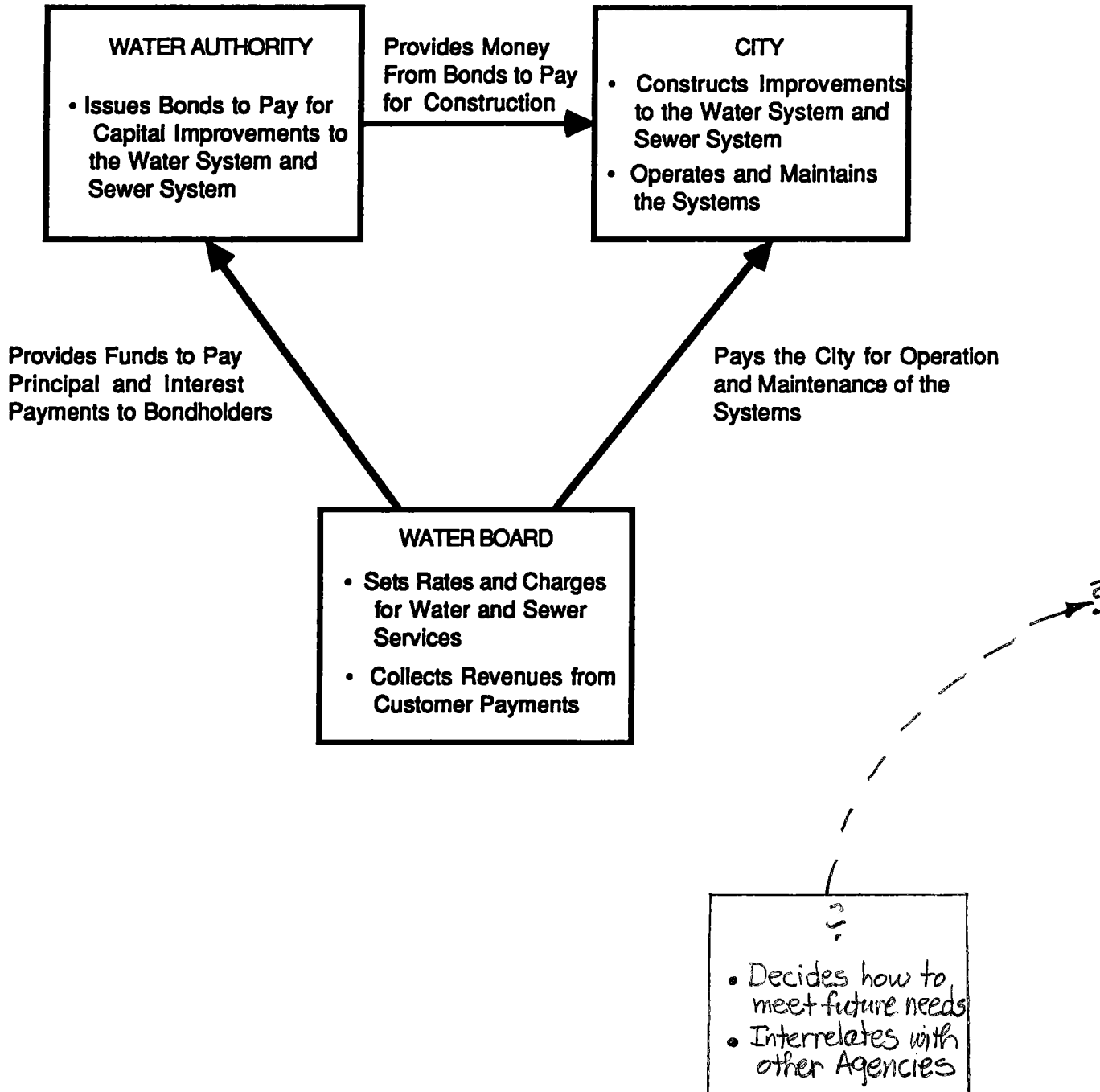
Frank Padavan



(Source of maps: "THIRSTY CITY, a plan of action for New York City Water Supply," by the Water Supply Project of the Citizens Union Foundation.)
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**SUMMARY OF THE FUNCTIONS OF THE WATER BOARD,
THE NEW YORK CITY MUNICIPAL WATER FINANCE AUTHORITY
AND THE CITY**



(Source: New York City Water Board.)

Chapter I.

INTRODUCTION AND OVERVIEW:

Clean, fresh water is one of our most precious resources. It is also one of the most naturally abundant of New York State's resources, a fact that doubtlessly leads New Yorkers to take fresh water for granted. Only when drought emergencies are declared -- circumstances occurring with increasing frequency in the past two decades -- do ^ewe realize that the faucets in our homes could someday run dry.

New York has suffered three major droughts in the past quarter-century -- 1965, 1980 and 1985. Although the Northeast receives an average of over 40 inches of rain per annum, and Long Island sits atop one of the largest hydrological banks in the world, the prospect of another severe water emergency in Southeastern New York looms ahead as we move toward the 21st century.

The principal source of potable water in the region, the vast New York City System, has a surface storage capacity of 550 billion gallons. The system has a safe yield of 1.29 billion gallons per day, however the current demand on the system is in excess of ~~1.5~~ billion gallons each day.

1.7

With normal daily demand exceeding the safe supply by more than 200 million gallons, this widening gap clearly exposes the New York City Water Supply and its users to the risk of a potentially severe drought.

In the last quarter century, the rate of consumption by New York City and localities that purchase water from the system has grown annually by 1.1 percent. Between 1960 and 1986, consumption jumped by one-fourth from 1.2 billion gallons per day to 1.5 billion gallons per day. ⁽¹⁾

Remarkably, these are not entirely new revelations. The rate of increasing water consumption and the widening gap between storage and demand have been widely studied by Federal and State entities over the past 20 years.

New York City has only recently taken steps to control demand that were recommended 15 years ago by the Temporary State Commission on the Water Supply Needs of Southeastern New York. That Commission's greatest fear when formed in the 1970s was that the status quo would be maintained and its recommendations would not be implemented.

In retrospect, a former commission staffer attributed the failure of government to act on the recommendations with these words: "It was a classic political battle, and the political costs were too high."

A perspective on the 15-year development of a water crisis, can be gained by examining earlier studies.

Chapter II.

LESSONS OF THE PAST

Temporary State Commission

On The Water Supply Needs of Southeastern New York

The fragile balance of the New York water supply systems was exposed by the drought of 1965. In response to the drought, New York State undertook an extensive water resource survey in 1967 and established the Temporary State Commission on the Water Supply Needs of Southeastern New York in 1969.

When signing Chapter 593 into law, Gov. Nelson A. Rockefeller stated:

"The efforts of this Commission will lay a proper foundation for meeting the water supply needs of New York City and the entire southeastern portion of the state for the remainder of the 20th century." (2)

The Commission was appointed and staffed in 1970. During its five-year lifespan, it conducted a multitude of hearings, studies, conferences, meetings and received hundreds of hours of testimony as preparation for the recommendations (see appendix) published in 1974 and 1975.

A total of 50 recommendations were issued to help insure that a plentiful supply of water would be available for the residents of New York City and the Southeastern New York region in the next century.

Despite the work and fanfare, not a single recommendation by the Temporary State Commission was adopted in the 1970s. Subsequent studies reaffirm the validity of proposals made by the Commission in 1973. The six major long-term water supply recommendations of the Mayor's Intergovernmental Task Force on New York City Water merely restate the Commission's earlier work. (3)

If the failure of New York City to implement Commission recommendations must be justified, inaction could be attributed to the financial crisis that both the City and State suffered in the mid-1970s. The immediate problem of providing essential services, and being able to financially support their delivery, won out over the anticipated future needs of the water supply.

One can only speculate on how adoption of only some Commission proposals would have dampened the impact of the droughts of 1980-81 and 1985. Considering the potential of current proposals, the impact of these two droughts would have been much less severe.

Alternative Future?

The Commission compiled many scenarios for the future of the water supply. The one chosen by default was rejection of the Commission Report by inactivity and maintaining the status quo. The Legislature and the local governments that would be affected at that time were not willing to fight the political battle and pay the price for a future with a plentiful and

reliable water source.

The commission's 1973 report noted:

"One possible route for future water supply matters is, of course, simply the continuation of existing arrangements, in which local water suppliers are responsible for local needs. New York City would maintain its quasi-regional responsibilities. This 'solution' of 'muddling through' would minimize immediate costs and legal changes, but could prove disastrous. Certainly, Nassau County which is running out of potable water would receive no relief.

"The problems of upstate counties, some of which depend to a great extent on the New York City system for water, would be unresolved. And New York City itself would find it difficult to obtain permission for additional water supply Upstate. In fact, this alternative meets almost none of the attributes described above as important to a new institutional arrangement for the region. The alternative of 'muddling through' must be discounted." (Emphasis added.) (4)

One year later the Commission stated:

"The option of muddling through is an option in political terms only. It would not encourage or direct the development of any new regional water supply source, or of any new regional

arrangement to administer supplies in an equitable manner.

Rather, it would let events control further action." (5)

Federal Intervention

Washington's concern over the drought of the mid-1960s resulted in passage of Public Law 89-298 in 1965. It was through this law that the U.S. Army Corps of Engineers became involved in the water supply issue in the New York Metropolitan area.

In its Northeastern United States Water Supply Study (NEWS), authorized by Public Law 89-298 and completed in 1979, the Corps of Engineers recommended the Hudson River as a supplemental water source for the New York Metropolitan Area. The specific Hudson River project favored by the Corps was a high flow skimming project which would direct up to 400 million gallons a day from the Hudson into the New York City System.

However, according to Lieut. Col. Marion L. Caldwell, New York District Engineer for the Corps, "Because this project was not part of a multipurpose project, would not involve interstate water transfers, and was a project which could be implemented by non-federal interests, it was determined that there was no federal interest in further planning and construction efforts." (6)

In 1984, in response to a request by the House of Representatives (House Report 98-308), a report on the Metropolitan New York Water Supply

was issued. It concluded "that the solutions to problems are single-purpose in nature and the Army's position is that such solutions are a local responsibility. Further studies and construction should be performed by local interests." (7)

The NEWS Report of 1979 also recommended:

1. Metering of all water users;
2. Monitoring and controlling leakage in conveyance and distribution systems;
3. Water saving devices in all new construction and major reconstruction;
4. A drought contingency plan. (8)

Water Conservation Efforts

Since the 1980 and 1985 Droughts

1984 brought changes in the way New York City water and sewer construction projects were planned and financed. At the request of the Mayor, the State Legislature enacted laws creating the New York City Municipal Water Finance Authority and the New York City Water Board.

A public benefit corporation created by Chapter 515 of the Laws of 1984, the New York City Water Board has the primary responsibility to fix, revise, charge, collect and enforce rates and other charges for the services rendered or made available by the water and sewer systems. The Board is required by law to establish rates that will provide adequate funds to pay the debt service on bonds issued to finance capital improvements, as well as

maintenance and operation, of both water and sewer systems. (9)

What creation of the Water Board meant to homeowners, businessmen and landlords is that water ratepayers now bear the full cost of the water system. Previously, individual water bills did not cover the full costs. The City of New York subsidized water system operations through the general tax levy. Rates were set as part of the annual budget process culminating in action by the City Council.

Today, water rates are set by the Water Board, instead of a City Council elected by the rate-paying population. Since the Water Board is appointed by the Mayor, the City's chief executive may be considered accountable for its decisions. Additionally, the board must be acutely sensitive to the rate of increase for water services considering the vital nature of this service and the method by which rates were historically set.

The New York City Municipal Water Finance Authority was created pursuant to Chapter 513 of the Laws of 1984 as a means of reducing the cost of borrowing funds needed for both new capital construction and repairs to the water system. Bonds issued by the authority are backed by the water rents set and collected by the Water Board. However, unlike ordinary utilities, any resulting revenue surplus is not used to reduce future water rates but instead goes directly to the City Treasury.

According to the office of New York City Comptroller Harrison J. Goldin, when the agencies were created it was hoped that the water authority would get a higher bond rating than the City. However, this has

not proven to be the case.

Creation of the two agencies also appears to have diminished, rather than enhanced, accountability. Elected City officials who had previously been directly accountable to the public may now "shrug their shoulders" when the operation or cost of water services are mentioned. (10)

In 1985, at the height of the City's second drought in a five-year period, Mayor Edward Koch established an Intergovernmental Task Force on New York City Water Supply Needs. The task force was charged with reassessing the city's long-range water supply needs and to review the adequacy of planning efforts to meet those needs. (11)

While this task force includes regional representatives drawn from local, state and federal agencies, it is very much a creation of New York City. It should also be noted that some water policy experts feel there is very little interaction between the Mayor's Task Force and the Water Board.

Robert Alpern, a member of the New York State Water Resources Planning Council and Project Director of the Water Supply Project of the Citizens Union Foundation, noted the lack of public participation in water resources planning during testimony before the Senate Cities Committee October 16, 1987. Mr. Alpern stated:

"The Water Board, which you are concerned about, is, in fact, the bottom line. They set their rates based on the plans that they accept from their consultants, and those

engineering consultants reports are also not linked in, in any way that I can identify, to the planning process of the state, the state Water Resources Planning Council or to the Intergovernmental Task Force.

"So we badly need an integration of planning, and it isn't happening now. That integration has to be accompanied by public participation, which is also not happening now."

The interim recommendations of the task force were released in the February 1986 report "Increasing Supply, Controlling Demand." They include:

1. Expanding the task force;
2. Monitoring demand;
3. Meter water use;
4. Control leaks;
5. Develop water-saving strategies;
6. Promote conservation;
7. Develop supplemental supply;
8. Evaluate long-term supply options.

Most of the recommendations posed by the Mayor's Task Force are carbon copies of proposals made 12 years earlier by the Temporary State Commission on the Water Supply Needs of Southeastern New York. One can only speculate how effectively the system would have weathered drought conditions had they been adopted a dozen years ago.

Chapter III

WHAT'S BEING DONE NOW

Universal Metering

The metering of water in the City of New York has been a controversial issue for well over a century. As the following editorial from the October 9, 1860 edition of **The New York Times** indicates, basic arguments have changed very little in 128 years.

"Our present system of water rates offers no possible check to any amount of waste. Charging people for water by the size of their dwellings, furnishing them facilities to draw thousands of gallons a day, and then charging them for as many hundreds, because their houses occupy a certain number of cubic feet of space, is as absurd as it would be to charge them for gas in proportion to their age or complexion.

"The only reasonable method of preventing waste is to charge each house with the water which goes into that house, and the only possible method of ascertaining this quantity is to measure it; or rather, let it measure itself, like gas, by passing through a meter. Then the amount of water that people are willing to pay for will be a very delicate test of what they want to use."

With 630,000 separate accounts, New York City is the largest unmetered water supply in the nation. Not until July, 1985 did the City

Council pass a local law requiring the installation of water meters in all new residential construction as well as in major renovations (improvements in excess of \$150,000). In January 1986, Mayor Koch announced his plan for universal metering of all water service within 10 years. However, this much more extensive metering program will not be ordered by local law passed by the City Council. Instead, it will be implemented by regulation under the powers of the Water Board.

The universal metering program proposed by the Mayor is an ambitious program with three major goals, water conservation, improved water supply system management and rate equity. However, critics of the program feel that the program will have little impact on renters, while homeowners will be hard hit. John Gilbert, President of the Rent Stabilization Association of New York expressed this concern to the committee:

"There is only one problem with the City's water conservation program. It will not work. We know that metering of resources conserves those resources only when the end user pays the bill. For instance, it is a well established fact that consumption of electricity drops significantly when buildings switch from master meters to individual meters.

"Unfortunately, retrofitting buildings for individual water meters is not a practical possibility. Since property owners are not permitted to directly pass on increased costs to tenants, most end users in the City will not pay for the cost of the water they use.

"In fact, 70 percent of New York's households who live in rental units will not feel the burden of increased water costs and will have no incentive to conserve water. The other 30 percent of the City's households, the City's backbone of homeowners, will end up shouldering the financial burden of indiscriminate water usage by renters.

"We have been told that increased water costs will be taken into consideration by the body which annually sets permissible increases for rent-stabilized apartments. That approach, however, does not have the direct and immediate impact on tenants which is needed to make conservation work.

"Moreover, where there has been separate allowances for utility costs in the past, the increases have been lower when the owner pays for the utility. That kind of pass-along system will never conserve water. To prevent this inequitable and unproductive situation, we have suggested to the City that any master meter plan for water be linked with a procedure that allows owners to pass on increased water costs directly to tenants. We have outlined to the City how such a procedure can be implemented on a simple and equitable basis. Our proposals, to date, have been totally ignored."

Assemblyman James Brennan of Brooklyn testified on the size of the projected increase for single-family homeowners in New York City.

"The bond DEP documents appended to my testimony show that, as the Water Authority raises capital from the bond markets, revenue necessary to sustain debt service and operating expenses from water and sewer fees will rise from \$416 million in 1987, yielding an average residential bill of \$147, to \$1.27 billion in 1996, a projected bill of \$455 for an average one-family home, to \$2.5 billion in the year 2001 and a resulting bill of \$884 for an average one-family residence.

"These figures assume an annual five percent inflation adjustment but nonetheless reflect a quintupling of water bills by the 21st Century. . . . Assuming that capital to be raised is necessary for the system, many important questions are raised by these projections. Should we, in fact, be moving from a system in which capital is financed by the broad city tax base as a whole, or should we be moving to an exclusively and entirely user-financed system?"

Two parts of the Water Boards plan to encourage water conservation are universal metering and more realistic pricing of the cost of water. This strategy would discourage the city's subsidy of the water system with broad based taxes and promote a user financed system. It would also price an essential commodity in such a way as to encourage conservation, while at the same time place it out of the reach of many low and fixed income citizens. It would also pit homeowners against apartment dwellers. Yet to be found is some type of escape valve that would protect those in vulnerable situations. Despite these concerns, water experts seem united

their endorsement of "true cost" pricing of water. Robert Alpern of the Citizens Union expressed these thoughts:

"The cost of water is a burden on the taxpayer, sure. But if you really believe in educating the taxpayer on the problems of water and if we really believe in sending him a price signal that will, in fact, reduce his waste of water, then the water bill must reflect the true cost of water."

Members of the New York City Water Board should therefore be vigilant to ensure that the established rates do not exceed the true cost of delivering water to a homeowner or business. Excess water rents should not be viewed as discretionary revenue by the city. For example, in 1986 the Water Board erred in their rate setting capacity and raised \$42 million more than it needed, adding about 10 percent to a customer's bills. The excess payment went directly to the city treasury. However, as the city's current policy is to continue to subsidize the water board, water rates did not rise as high as they might have.

One must consider the future, however, and contemplate how long this rental subsidy will continue considering the political uncertainties of City Hall. Not only must a device be found that protects low and limited income homeowners against excessive rate hikes, but rate-setting methodologies must be refined to either avert excessive surpluses or direct excess funds to the lowering of rates.

DEC Statewide Strategy

In 1984, the New York State Legislature enacted the Water Resources Management Strategy Act which required that the New York State Departments of Health and Environmental Conservation work together to develop a statewide strategy to provide a basis for better state and local water supply management decisions.

The first report covering the Delaware and Lower Hudson Region was prepared by the engineering firm of Hazen and Sawyer and was issued in September of 1987. The report's initial findings and conclusions covered these eight areas:

- * Surface Water Resources
- * Groundwater
- * Metering and Monitoring Water Consumption
- * Regionalization
- * New York City System Supply Deficit
- * Planning for Additional Water Supply for the New York City System
- * Small Systems, and,
- * Infrastructure Needs ¹²

(Specific findings and conclusions as they affect New York City are included in appendix II.)

In its draft form, the strategy has received mixed reactions. Several of its recommendations have been proposed before.

The most vociferous opposition has come from environmental groups and counties that border the Hudson River over the proposed use of the river as a source of supplemental supply for the City of New York. The

Environmental Management Council of Ulster County harbors a great concern over the river's function as an essential estuary and has offered the following comments in that regard --

"In August, 1987, Governor Cuomo signed into law 'the Hudson River Estuary Management Act' which provides statutory recognition of the Hudson River Estuary as a distinct and valuable ecosystem and calls for an ecosystem approach to the management of the river. In the draft strategy, consideration is given to the river as a water supply only and not to the ecosystem as a whole. A broader and longer view must be taken, not only because it is now mandated by law but also because of the complex nature of the river and the varied roles it plays as fish nursery, recreational resource, water supply, effluent diluter."¹³

Scenic Hudson also expressed its reservations that the strategy document is biased. Environmental Director Cara Lee submitted this testimony:

"We believe that the document does not respond to many of the unique water supply issues that face this region and displays a strong bias toward justifying New York City's plans to expand its sources of supply in the absence of appropriate demand-management of its existing supplies."

The critique of Ms. Lee also noted:

"The Hudson River is not a fresh water reservoir waiting to become a water supply, nor is it a supply of fresh water running wastefully to the sea. It is an estuary.

"Estuaries are considered to be among the world's most productive classes of ecosystems, providing nursery and spawning grounds for anadromous and catadromous fish as well as other organisms. Salinity and other aspects of water chemistry are basic to the functioning of this vital ecosystem. And, at this time, the daily, seasonal, occasional and annual fluctuations in salinity in the Hudson River are poorly understood in relation to its very valuable biotic community.

"What is known is that the freshwater component and its fluctuations are essential to the functioning of the estuary. To view the freshwater flow during any season as 'extra' is simplistic and crude. Although freshwater flows can be artificially regulated by releases from Adirondack reservoirs, sustained releases have their undesirable effects locally on the recreational value of the reservoirs as well." ¹⁴

Capital Construction

The Third Water Tunnel is the principal construction project currently underway in the New York City water system. Started in 1970, Third Tunnel construction all but ground to a halt during the City's fiscal crisis in the mid 1970s.

The objective of this massive undertaking is to provide a third avenue of water transmission from the City's reservoir systems. The two tunnels currently serving the system have gone virtually uninspected and unrepaired since they were brought on line. Completion of the Third Tunnel will allow Tunnels One and Two to be shut down, inspected and repaired with no loss of service to city residents.

According to Joseph Conway, Director of the Bureau of Water Supply, "We are now looking at 1989 for completion of construction of the first stage. . . . The water will be flowing in the first stage in 1991."

Regarding the cost, Conway said, "A revised estimate was prepared when we went back into full gear in 1977, and we're pretty much on target right now." Conway estimated the cost to New York City at \$950 million for Stage 1. A total of \$1.8 billion is calculated for both the Brooklyn-Queens leg and the Manhattan leg of Stage 2.

Completion of the Third Tunnel is a high priority of the City Administration, as Mayor Koch has testified.

"The Third Water Tunnel is one of the city's most important capital projects. The 13.2 mile stage 1 portion of the tunnel is almost complete with only one major contract left to fulfill. We are currently negotiating on construction of the chlorinating facility that will serve both stages I and II of the tunnel, and hope to be moving forward with the design contract in the Spring of 1988, with construction to start about a year later.

Work on stage II of the tunnel will begin shortly with the sinking of the Nelson Street shaft in Brooklyn at a cost of \$20 million to the City."

Croton Filtration

Increased development in the Delaware-Catskill Watershed counties has magnified concern for the future quality of the water supply. Paramount to maintaining water quality is proper watershed management. Better planning and coordination with local authorities is essential if New York is to continue to enjoy the high quality of water to which it is accustomed.

The alternative to improved watershed management would mean staggering financial costs. Currently under construction at the request of the New York State Health Department is the City's first major filtration plant. The plant at the Jerome Park Reservoir in the Bronx will service the Croton Supply, whose water quality has suffered as a result of property development in Westchester County. The cost to the City for this plant will be approximately \$400 million.

Also looming on the horizon are proposed Federal Environmental Protection Agency's regulations requiring filtration of all surface water supplies. Unless New York City can obtain an exemption from these regulations, the city would be required to spend between \$2 and \$3 billion on filtration plants for the Catskill - Delaware Supply. We will examine this issue in more detail in a later section of this report.

Chapter IV
WHAT MUST BE DONE?

New Sources of Supply/ Controlling Consumption

Perhaps the most obvious course to avert a water shortage in New York City would be to develop additional capacity through new sources and supplies. However, this is much easier said than done.

The Hudson River

The Hudson River is most frequently mentioned in recent decades as a potential new water source for New York City. Over the past 15 years Federal, State and New York City agencies have advised use of the Hudson to augment city supplies in a variety of ways.

Carol Ash, Region II Director for the New York State Department of Environmental Conservation (DEC), reviewed some of the options in her testimony before the Committee.

"The City has conducted a preliminary feasibility study to assess engineering options of permanently pumping 100 to 300 million gallons a day from the river, either by expanding the existing emergency pumping station at Chelsea, or by constructing new pumping facilities at Newburgh or Kingston. There has also been renewed discussion about a possible high

flow "flood skimming" project which could involve expanded Hudson River flow regulation from the existing Sacandaga or Hinkley Reservoirs or a new Gooley Dam in the Adirondacks.

"Several factors must be considered before a permanent project could be authorized on the Hudson. Although there is a considerable amount of fresh water in the Hudson, the river's salt front migrates a considerable distance. Movement of the salt front is not entirely understood. Upstream, freshwater flow is the greatest influence, but tides, wind, the depth of the navigation channel and pumpage from the river also exert influence.

"Movement of the salt front could affect water supply operations, and could also have an effect on the biological resources of the river, including spawning of anadromous fish. We are working with the USGS (United States Geological Survey) to develop a study proposal to more accurately monitor and model salt front movement in order to determine what freshwater discharge rate is required to hold a given chloride concentration downstream of a specified location. We are currently in search of funding to match the 50 percent USGS share of study costs.

"Pursuant to state law, we have established an estuarine district on the Hudson. We have appointed Fran Dunwell to be our estuary coordinator, responsible for establishing programs and developing a management plan for the river. The plan will

consider the impact of major withdrawals on river ecology, fish and wild life and the salt front."

Mayor Koch testified on the scope and the cost of the high-flow skimming project.

"One of these long-range options is a Hudson River High-Flow Skimming Project, estimated to cost about \$2.5 billion and to yield in the range of 300 - 600 million gallons of water per day. High-flow skimming would permit withdrawals from the Hudson River that would be as high as one billion gallons a day during high-flow periods. The project could produce 800 million gallons a day by augmenting the flow of the river with releases from upstate reservoirs, using the river itself to convey this water to the high-flow skimming or pumping plant. The cost of this additional augmentation would add approximately \$300 million to the overall cost of this \$2.5 billion project."

Reducing Consumption

While planning for the additional system capacity requires long range planning (25-30 years or more), some individuals feel that too little emphasis is being placed on long-term consumption reduction. Emergency water conservation measures have had only reasonable success in New York City. However, increased consumer awareness and lifestyle adjustments are needed before permanent usage reductions can be realized.

Robert Alpern of the Citizens Union related these thoughts to the Committee:

"In my view, the City, despite what they say, has really not even begun to have a water conservation program. Water metering is a step in the right direction. It is necessary, but not a sufficient action even for that purpose, accompanied by a rate structure which is going to use metering to encourage conservation."

And Thomas Miner, Executive Director of the Catskill Center, expressed these concerns:

"For emphasis, I would like to highlight several points. First, the Catskill Center is extremely concerned that water strategy planning begun by New York City during the 1985 drought has from its onset been too focused on new supply. It is our strong belief that demand reduction and use management are more critical to protecting the city against future shortages than are additional sources of supply." ¹⁵

In relation to the use of the Hudson to supplement New York City supplies, Mr. Miner made the following statement regarding New York's draft Water Resources Management Strategy:

"We do not have before us a state strategy for water resource management that will protect present supplies or resolve

problems of future shortages.

"Before us today is the proposed state authorization for New York City to appropriate the principle surface water resource in southeastern New York State -- the Hudson River, with no assessment of the impact of the proposal on the water resource itself, nor of the impact on the many communities for which the Hudson represents the sole source of future supply.

"The draft State Water Resources Management strategy, implicitly and directly makes New York City's interests the state's interests. The Catskill Center challenges that proposition, both out of interest for the upstate communities in which the water resources are located and out of interest for New York City itself." ¹⁶

Brooklyn-Queens Aquifer

At the turn of the century, the Brooklyn-Queens Aquifer was the sole source of supply for thousands of residents in Queens and Brooklyn. Of the many reasons for the unification of New York's boroughs, not the least among them was access to a reliable source of water for the then-City of Brooklyn and Queens County. Then, like today, development and expansion were tied to a reliable water supply.

Though unification brought access to new watersheds, the Brooklyn and Queens wellfields continued to be pumped well into the 20th Century.

Today, half a million customers in Southeast Queens served by the Jamaica Water Supply Company continue to receive water pumped from the Jamaica wellfield.

Mainly due to saltwater intrusion, many of the wells of Jamaica Water Supply and other private water companies were closed, beginning in the 1940s and continuing until the present decade.

The intrusion of saltwater was caused by over-pumping of the aquifer in various locations. Because of this contamination the State Health Department ordered these sites closed. However, the forced closings have given well sites an opportunity to rest. Through proper conjunctive management and regulated pumping, they may again prove valuable as a supplemental supply.

Mayor Koch directed his testimony to this point at the Committee's hearing.

"Another potential medium-term source of supply is additional use of the Brooklyn-Queens Aquifer. This groundwater has been the subject of intense scrutiny, not only by the Intergovernmental Task Force, but also by Federal, State and City authorities, who recently completed a five-year study of the aquifer. A second study performed under the provisions of Section 205(j) of the Federal Clean Water Act has also recently been completed by O'Brien and Gere, consultants to the City DEP.

"These studies have provided valuable information to the Intergovernmental Task Force in their evaluation of the Brooklyn-Queens Aquifer as a viable supplemental source of future supply, and on the best methods of tapping into this source. Continuous pumping, periodic pumping and periodic pumping for long-range conjunctive use have all been evaluated by the Intergovernmental Task Force, with natural and artificial recharge times for the aquifer factored into the calculations.

"Artificial recharge, meaning the injection of city water into the ground or aquifer, would help to both replenish the aquifer more rapidly and improve the overall quality of the water when it is pumped back out of the aquifer.

"With careful management and strict monitoring, tapping the Brooklyn-Queens Aquifer may be a viable way to supplement our water supply in the relatively near future. Certainly, the idea of being able to utilize a local supply of water, if this proves to be a safe and feasible option, is appealing."

The mayor's optimism over the use of a local water supply was bolstered by the O'Brien and Gere study. It concluded:

1. Available data indicates that the Brooklyn/Queens Aquifer is a viable source of water supply. On average, up to approximately 80 million gallons a day (29.2 billion gallons annually) of groundwater are available for supply. A minimum (more may be required) of 36 million gallons a day

(13.1 billion gallons annually) of groundwater must be withdrawn in order to prevent extensive flooding.

2. Under existing conditions, the United States Geological Survey (USGS) groundwater flow model indicates that an additional 50 million gallons a day may be obtained from the Brooklyn-Queens Aquifer without adverse effects for a period of 15 months, providing New York City with 22 billion gallons which is equivalent to an additional 17-day supply for the entire city.

Under full reservoir (i.e. groundwater system has recovered to pre-development levels and no major pumping exists except for dewatering purposes), the USGS groundwater flow model predicts that 200 million gallons a day may be obtained without adversely affecting the aquifer for a period of 64 billion gallons which is equivalent to a 50-day supply for all of New York City.

3. Although artificial recharge may not be viable on a continuous basis, limited artificial recharge may be viable for augmenting the groundwater supply after emergency use. Based upon preliminary review, upstate reservoirs may be able to provide up to 6 billion gallons between early March and late May to recharge the aquifer.

In summary, the report found that if groundwater withdrawals are properly managed, the Brooklyn-Queens Aquifer may be safely utilized as a source of potable and non-potable supply as well as a source of emergency supply. ¹⁷

Water Quality

Catskill/Delaware Filtration?

Based on research by the U.S. Center for Disease Control, the Federal Environmental Protection Agency (EPA) proposed regulations on November 3, 1987 which would have a significant impact on the New York City Water Supply.

The proposed regulations could require New York and every municipality in the United States that uses surface water, to filter as well as disinfect their supplies to control the *Giardia lamblia* parasite and a host of other water-borne parasites and viruses.

It is unclear at this time whether New York City would be exempt from some of these regulations. As the largest surface water collection and distribution system in the nation, many problems which beset smaller systems, do not necessarily apply to the City system.

Officials of the New York City Department of Environmental Protection are studying the proposed regulations to determine whether the City could be exempted from the regulations on the basis of the system's size and the high quality of the water in the Delaware-Catskill system compared to an EPA-devised national standard. City water experts and environmentalists differ on the question of compliance with the proposed regulations.

For example, Robert Alpern of the Citizens Union Water Supply Project offered these comments:

"You've been concerned about costs and been concerned about the cost to the consumer, and you've been concerned about how they reflect major capital items. One major capital item has been completely missing from the testimony so far and is, in fact, on the front burner of most of the bureaucrats that you have been talking to. That is the possibility, almost the requirement, of a major water pollution control plant for the Catskill/Delaware supply, a filtration plant.

"Under the Safe Drinking Water Act amendments of the Federal government, all surface systems must be filtered with certain very, very tightly drawn exceptions. It's not clear that New York City will escape those exceptions. Under the water resources strategy -- and this, as I understand it, came from the (New York State) Department of Health -- all surface supplies must be filtered . . . without exception. That's the draft. The costs are in the multi-billion dollar range. They far outstrip the costs of, say, Stage II of Tunnel Number 3 (approximately \$1.8 billion).

"If required to construct this type of facility for the Catskill/Delaware supply, New York City could be faced with massive unanticipated capital costs of between \$2-3 billion by some estimates. This would translate into either halting

construction on the third tunnel again, or raising massive amounts of new capital money by the Water Finance Authority. This increase in bonded indebtedness would mean still higher water rates in New York City for a long time to come."

Hudson River/Filtration Treatment

The drought emergencies of 1966 and 1985 inaugurated the use of the Hudson River as an emergency supplemental supply. Water drawn from the Hudson was extensively chlorinated before it was introduced to the city's reservoir system for clarification and storage. An ill effect, according to the sportsmen who fished the reservoirs at this time, was that the extensive chlorination had detrimental effects on fish populations.

The Army Corps of Engineers in its NEWS study found that any increased use of the Hudson would require that a filtration system be incorporated in any plans for increased diversions or high-flow skimming.

Brooklyn-Queens Aquifer

Poor management by a conglomeration of small water companies in the first half of the century resulted in improper well siting and over pumping. High chloride concentrations, a result of saltwater intrusion, have been detected predominantly near the past and present pumping centers of the public water suppliers.

In certain areas where the groundwater system has been allowed to recover, saltwater has receded and quality has improved. Still other wells remain closed because of organic chemical contamination. The three chemicals most prevalent are chloroform, tetrachloroethylene and trichloroethylene. Chloroform results from chlorination of the water supply. The presence of the other compounds is most likely the result of improper chemical use, storage and disposal. ¹⁸

In order to better manage and more fully realize the potential of the aquifer, O'Brien and Gere, the City's engineering consultants recommended the appointment of a coordinating agency.

"A lead agency must be established in order to coordinate the management plan for the Brooklyn/Queens Aquifer. As part of the plan, the lead agency would be responsible for coordinating the expansion of the existing protection, monitoring and permit programs with other agencies involved in groundwater policies. With the implementation of a management plan, the Brooklyn/Queens Aquifer may be utilized in accordance with water quality standards and its best use as a valuable and reliable source of water supply." ¹⁹

There should be no argument that the aquifer needs better management in order that its potential can be realized. However, a strictly independent agency may further fracture regionalized cooperation when more coordinated management is necessary. Management of the aquifer must consider aquifer recharge in times of reservoir overflow as well as the potential sharing of resources between New York City and the Long Island

counties. Conjunctive management of all City supplies will be necessary in order to meet the water supply challenges of the 21st century.

Plumbing Fixture Law

In addition to metering the city water supply, there are other means available to insure that this valuable resource is used wisely.

One way is through enforcement of New York State's Water Savings Fixture Law (Chapter 516, Laws of 1979). This legislation establishes water saving performance standards for all plumbing fixtures distributed, sold or installed.

The New York State Department of Environmental Conservation is the agency charged with enforcing this law. It is vitally important that the Department maintain an accurate and up to date list of approved fixtures in order to insure that the plumbing industry carries out this mandate.

Recently, New York City asked for additional state legislation (S.6342/KNORR) in order to better enforce this law. This bill would allow the City to adopt a law providing local enforcement and insuring that penalties are levied for non-compliance. However, before any state legislation is passed, it is vital to make certain that individuals who have made a good faith effort to comply with this statute not be penalized for the actions of those beyond their control.

For example, John Gilbert of the Rent Stabilization Association brought these concerns to the Committee.

"I would like to make one final comment on the New York State water savings fixture bill, which the city would like to implement on a local basis. I believe that it is necessary to ensure that only water conserving fixtures may be installed. However, the City's proposal would permit property owners to be penalized if a non-water conserving fixture is installed. Clearly, the best way to enforce such a provision is by ensuring that manufacturers and retailers only produce and distribute approved fixtures in this State.

". . . Experience tells us that owners could be held responsible for tenant action. If a tenant wants to replace a conserving shower head, for instance, the owner is powerless to prevent that from happening. Placing the enforcement onus on owners is as misguided as the plan to conserve water by attempting to make owners pay for tenants' water use."

Conjunctive Management

Water supply management and distribution in the year 2000 is going to require new strategies and techniques. We must modify a system rooted in the 19th century for the challenges of the 21st.

One strategy that should be explored is conjunctive management. As

explained by Robert Alpern, this creative approach would employ different systems working together in order to minimize the costs of additional supply. An example of such a conjunctive water management plan, he said, is the so-called "Long Island Exchange."

"This is basically using the underground sources in either Brooklyn or Queens, or in Nassau and Suffolk County as a reservoir which can be filled, in effect, by upstate water in times of plenty and can be drawn on in times of drought. There are other possibilities too that should be explored. Those possibilities are not now being exploited in any fruitful way by either the state strategy or the Intergovernmental Task Force."

Dan Sheer, a leading expert on water supply, views conjunctive management as management of the water resources of the Delaware Basin, Hudson Basin and Long Island aquifers as a vast, interrelated water system linked through the City of New York.

However, before any plan that has been advanced is adopted, cooperation throughout the region must be improved.

Better Intergovernmental Cooperation

For any plan to succeed, it requires the cooperation of all participants. As water supply has traditionally been a parochial matter for municipalities, overcoming this obstacle is difficult, but nonetheless essential.

If we can be sure of anything, we can be sure that the competing needs of the 21st century will be placing additional pressure on our water supply. Although New York is considered a water rich state we must be increasingly vigilant to insure that our supplies remain pure and sufficient. For New York City, this quest will require an unprecedented level of cooperative management between municipalities in watershed counties.

If the purity of water supplied to the New York City water system by the Catskill-Delaware Basin is to be protected, development in the watershed counties cannot run unchecked. New York City can ill afford the multi-billion dollar cost of filtering this supply. However, it would be naive to suggest that development cease in the Mid-Hudson Region. Planned development fully considering the land's vital role as a watershed must be encouraged. In this way, both interests would benefit, and future demands upon this supply from upstate as well as downstate communities would be taken into account.

Mayor Koch touched on this point in his testimony:

"As the demand for New York City water grows both downstate and upstate, our regional interdependence will grow, and our regional network must expand accordingly.

"This is particularly true with the recent establishment of an entire county, Orange County, as a Water District, through

Chapter 709 of the Laws of 1987, and because an increasing number of upstate communities need to augment their own water supplies in order to keep pace with development. With the increasing demand of upstate residents added to the increasing demand within New York City, regional cooperation is a necessity.

"The creation of larger water districts will also impact on our future planning efforts. We will supply water, but the water must be there. Substantially, increased demand may be impossible to satisfy without further water supply development in upstate communities.

"For example, in certain areas of the state, regional cooperation would be necessary to gain the legislative approval required to authorize new sources of supply for the city. Throughout the State, we will have to work together to ensure that reservoir capacity will serve future needs."

New York City has made substantial progress since the 1985 drought but much has yet to be done to insure plentiful supplies into the 21st Century. Establishment of the Mayor's Intergovernmental Task Force was a positive step that should be applauded. Efforts should be made to increase the highest level of regional cooperation throughout all the watershed counties.

Further, consideration should be given to making the Inter-governmental Task Force a permanent entity so that it can continue its work immune from changes in the political agenda at City Hall.

Finally, the Task Force should integrate its efforts with those of the New York State Water Resources Planning Council to insure that a statewide perspective is included in any city/regional cooperative effort.

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PRELIMINARY RECOMMENDATIONS

One of the major concerns of the Committee is that the City of New York and its regional neighbors continue to enjoy a plentiful, clean and abundant water supply well into the 21st Century. In that regard, the Committee recommends the following:

1. New York City's creation of the Mayor's Intergovernmental Task Force on Water Supply Needs in 1985 is commended. This body filled a vacuum left after the Temporary State Commission on Water Supply Needs of Southeastern New York was dissolved in 1975.

The Task Force should continue to expand its focus to a regional perspective and avoid the temptation to represent just the interests of New York City. Effort should be made to ensure the highest level of regional cooperation between the City, its watershed counties and Nassau and Suffolk County. With proper regional cooperation and planning efforts, sensible development can continue while protecting the watersheds and aquifers. The task force should also integrate its efforts with those of the New York State Water Resources Planning Council to ensure that Southeastern New York's efforts complement Statewide water supply planning.

Also, the Task Force should be made permanent so that its work can continue despite any changes in the political agenda at City Hall.

2. Improved management of Catskill/Delaware watershed lands is necessary

in order to preserve the water quality for future generations. Cooperative efforts between the effected counties and New York City must take place in order to avoid the costly filtration plant now required for the Croton Supply in Westchester County.

3. Conjunctive Management of New York City's vast regional network should be seriously explored. Innovative water supply management techniques such as this can help to insure that New York City will have the capacity it will require in the year 2000.
4. As engineering studies have concluded the viability of the Brooklyn-Queens aquifer as a source of supplemental supply, efforts should be made to incorporate this source into any conjunctive management plan.

These efforts should also include strategies for artificial recharge using the seasonal runoff from the city's reservoir system. New York City should also accelerate its efforts in condemning and assuming control of the Jamaica Water Supply System. This will insure consistent and reliable service for the residents of Southeastern Queens.

5. Rate setting methodologies used by New York City's Water Board should be further refined to prevent the accumulation of huge surpluses at the expense of ratepayers. If indeed, the only way to encourage water conservation is to price water according to its "true cost", then any surpluses which accumulate should be dedicated to lowering rates and not considered discretionary income in the City's general fund.

6. The City's current metering policy could pit homeowners against apartment dwellers. As currently designed, the water rate structure could become an enormous burden on many low and fixed-income residents by the year 2000. A rate-setting methodology must be devised to protect those most vulnerable.
7. The New York State Department of Environmental Conservation should vigorously enforce New York State's Water Savings Fixtures Law which was adopted in 1979. By continuous updating of the regulations on approved fixtures the industry will be encouraged to police itself in order that only water savings fixtures will be distributed, sold, and installed in New York State.

Before any local law is adopted in New York City to insure better enforcement of this state law, consideration must be paid to landlords who install approved fixtures only to have them replaced with non water savings devices by tenants.

8. With regard to the membership of the New York City Water Board and the Water Finance Authority the Mayor should increase his vigilance to appoint highly qualified individuals without vested financial interests in water supply issues or construction contracts.

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4. "Water for Tomorrow", Temporary State Commission on the Water Supply Needs of Southeastern New York, 1974, p. 24.
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9. New York City Water Board, Public Information Briefing on Water Rates, April 1987.
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11. "Increasing Supply Controlling Demand," February 11, 1986. Mayors Intergovernmental Task Force on New York City Water Supply Needs.
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14. Cara Lee, Scenic Hudson, Comments on the Draft Delaware-Lower Hudson Water Resources Management Strategy, September 29, 1987.
15. Thomas Miner, The Catskill Center, Correspondence to Senator Frank Padavan, November 23, 1987
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18. Ibid. p.iii
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News from the Senate Committee on --- Cities

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A PUBLIC HEARING

NEW YORK CITY WATER RESOURCES: A Strategy for the 21st Century?

New York City Hearing, Oct. 16, 1987

OPENING REMARKS BY SEN. FRANK PADAVAN CHAIRMAN, SENATE CITIES COMMITTEE

The subject of this hearing is the New York City Water System. And, our question is -- how will this system meet the needs of New Yorkers in the 21st Century, a milestone only 12 1/2 years away?

New York's system of aqueducts has been a major factor enabling the settlement of New Amsterdam to become one of the world's most prosperous and densely populated metropolitan regions.

Yet, it seems that high-quality drinking water is a substance that we best appreciate when it is least available.

Mayor Koch has appointed a task force to plan for the future of the water system and thus avoid further and more serious water emergencies. However, arriving at new, acceptable water sources for the anticipated needs of the next century may prove to be far more difficult today than at any other time in the City's history.

There are a number of questions bearing on the supply, conservation and cost of water to consumers that we will be asking Mayor Koch and other officials here today. First, however, I believe a few points should be made as an introduction to our discussions.

We recognize that water quality and supply are both interstate and regional issues. The New York Water System supplies not merely the five counties comprising New York but the Mid-Hudson Counties to the north; and, the Delaware-Catskill Catchment Area is dependent on a compact also involving the states of New Jersey, Pennsylvania and Delaware.

These relationships are vital not only to the maintenance of existing supplies but also our prospects for expanding capacity to meet future water demands. The demand on these supplies is growing, and increasing at a

steady rate despite recent improvements in water conservation efforts.

Since the Cannonsville Reservoir became part of the Delaware System 23 years ago, storage capacity has stood at 550 billion gallons. However, we have seen in recent years that this 12-month supply has not insulated New Yorkers from the effects of drought.

If our reserve is inadequate today, how can we expect the supply to meet continuing increases in consumption? The averaged increase has been 1.1 percent of the daily demand over the past 25 years. Can the system absorb housing gains in the boroughs?

Can it meet increased growth in the northern counties; and the continued decline in the quality of water from well sites that tap the Long Island aquifer?

My fear is that it cannot. Without even considering the impact of a drought, our reserve capacity is already vulnerable. It may be an 11-month supply long before we reach the year 2000.

For water users, the troublesome restrictions that were brought on by recent droughts would seem very slight compared to the penalties we might face by failing to adequately boost our water supply.

Without adequate planning today, consumers are likely to face the prospect of tap water priced to compete with Perrier.

For this to occur anywhere would be terrible. To occur in a section of the nation with vast pure water resources would be tragic.

Our committee is prepared to work with the City Administration and concerned citizens organizations so that we can be certain that low cost and high quality water continues to be available to the people of New York this year, next year and in the next century.

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APPENDIX II

"WATER FOR TOMORROW"

Recommendations of the Temporary State Commission On The Water Supply Needs of Southeastern New York. 1974

MEETING WATER NEEDS

Increasing the Water Supply

1. In order to meet regional water supply deficits projected by the commission, the following are recommended to increase the supply of water:

A.1. Construction of intake works, treatment and pumping facilities for a withdrawal from the Hudson River in the vicinity of Hyde Park and an aqueduct to West Branch Reservoir by 1985. The facility would be operated to furnish 285 million gallons of water per day as a flood skimming project with provision for expansion to a continuous withdrawal operation.

2. Expansion to provide for increased yield to 500 million gallons of water per day by use of additional upstream storage at Hinckley and extension of aqueduct to Kensico Reservoir by 2005.

3. Integrated operation of the new source and facilities with the existing Catskill, Delaware and Croton Systems.

B. Provision for adequate transmission capability and capacity to deliver water to the entire service area, particularly to Nassau County by 1985.

C. Development of feasible local projects in Orange, Rockland and Suffolk Counties.

D. Development of major recharge facilities in Nassau County.

Reducing Water Consumption

2. To assist in meeting regional water supply deficits the following are recommended to reduce water consumptions.

A. Universal water metering, particularly in New York City, be instituted and be completed by 1985. This will help to meet the projected needs by reducing water consumption an estimated 240 million gallons per day by 2020.

B. Additional conservation measures such as a leakage control program, use of water saving appliances, use of pricing mechanisms, and a long range education program should be undertaken in conjunction with universal metering. Metering is a necessary precondition for the effective development of these programs.

C. In order to encourage water conservation measures New York State in cooperation with the Delaware River Basin Commission should petition the U.S. Supreme Court to eliminate the present "excess release" requirement imposed on the City of New York by the Court based on the 1930's drought.

Perspective and Approach

3. In order to implement the proposed program a new institutional arrangement for the region is recommended. The southeast region is faced with the need for a new perspective and approach. Most of the counties and the city have water supply problems that can only be approached in a regional context. Most of the counties and the city individually lack the capability to cope with the increasing water supply needs, coupled with the environmental complexities.

New sources of supply, improved transmission capability, effective use of the water resources, urban water resource integration, environmental responsiveness and regional development are some of the major elements that require a new regional outlook and approach.

Recommended Regional Approach

4. It is recommended that a regional Southeast Water Facilities Corporation be established by special act of the legislature with an effect date of April 1, 1976. The corporation would be a self supporting instrumentality of the state and would plan, develop, construct and operate the recommended water supply facilities for the region.

The corporation would take over New York City upstate facilities and operate these facilities in an integrated manner with the recommended projects. This recommended approach would make most effective use of the available water resources and existing water facilities, maximize economies of scale and operational efficiency, best serve the needs of source and service areas, and introduce a high level of environmental responsiveness.

5. It is recommended that an implementing agency be created by the legislature effective April 1, 1974. This agency will provide a transition period of two years from the present arrangements to the new Southeast Water Facilities Corporation. The agency will be charged with the responsibility for effecting a smooth and orderly transition to enable the corporation to become operational in a short period of time.

MEASURES TO REDUCE WATER CONSUMPTION

CONSUMER METERING

6. Every consumer from a major community water system in the southeast region should be metered. Such action will reduce water consumption an estimated 240 million gallons per day, mostly from the New York City system by the year 2020 and provide system operators with an essential management tool in controlling leakage and unaccounted-for water, and in establishing fair and equitable rate schedules. Appropriate legislation should be enacted at the state level to require metering of the remaining unmetered services.

7. Universal consumer metering should be initiated in New York City. This course of action has been recommended for the last century and is fully justified to improve efficiency, reduce water consumption, reduce wastage and to raise management effectiveness.

A detailed plan and implementation program should be developed to meter the remaining unmetered services by 1985. This should be mandated by state legislation.

LEAKAGE CONTROL

8. A regular leakage control program should be established for all community water supply systems. Surveys and field investigations on a regular basis are essential, as opposed to a breakdown program which is based on main breaks, pressure drops, localized flooding or pavement collapse. This would also put leakage control on a systematic basis and eliminate speculative assessments. A necessary precondition for an effective leakage control program is universal metering. This pinpoints areas of changing water demands, allows detailed system analysis, locates leaks, and provides a continuous record and audit of the water furnished and consumed in the distribution system.

WATER-SAVING APPLIANCES

9. The use of water saving toilets, shower heads and appliances should be encouraged. Over an extended period of time up to 15 gallons per capita per day could be saved. Requirements for water saving appliances should be incorporated into building codes to cover new and renovated buildings.

WATER PRICING

10. Water pricing to possibly influence consumer consumption should be investigated for possible use in the region by water purveyors. It is recognized that water is not a free market good as pricing policy is constrained by regulatory requirements. However, to the extent that discretion is allowed, pricing mechanisms (through the use of penalties for excessive consumption as an example) may be of value in reducing demand. Universal metering is a necessary precondition for use of pricing mechanisms.

PUBLIC EDUCATION

11. A long range public education campaign should be undertaken by the schools, municipalities and water supply institutions, relative to the importance of water and the need to use it wisely. It should be part of the current development of programs related to environmental management and conservation.

In times of crisis, such as occurred in the 1960's, a crash campaign coupled with symbolic and substantive water use restrictions was undertaken. Such efforts, while outstanding successes, cannot be sustained for a long period of time or in times of water plenty.

As with other conservation efforts, universal metering is a necessary precondition if any long term education program is to be credible and effective.

LOCAL PROJECTS

NASSAU COUNTY

12. A project to furnish additional water for Nassau County must be developed as soon as possible to meet a critical worker deficit. A groundwater recharge project using renovated wastewater in an amount up to 70 million gallons per day should be undertaken immediately. (Also see recommendation 29)

The regional corporation should provide for the importation of upstate surface water by 1985 through project development.

ROCKLAND, ORANGE, AND SUFFOLK COUNTIES

13. Proposed local projects should be implemented as need dictates providing they are acceptable locally.

NEW YORK CITY AND ULSTER, DUTCHESS, PUTNAM, AND WESTCHESTER COUNTIES

14. In order to meet the water needs of these areas, the proposed regional project should be undertaken immediately.

LOCAL INSTITUTIONS

GENERAL

15. Meeting the water supply needs of southeastern New York call for consolidating services and facilities on the city, town and village levels; providing for the meeting of development needs; phasing out of unsatisfactory developer type systems; integrating the planning and operation of all urban water services; and establishing a new regional configuration and format to meet future needs.

COUNTIES

16. Each county should establish and maintain a strong county water, sewer and drainage agency. This agency should:

- A. Develop a county water supply plan and update biennially.
- B. Create county wide or part county water districts as needed.
- C. Manage and operate any water supply facilities constructed by the county.
- D. Insure that future water supply developments conform with the county plan.
- E. Provide technical services to local town, village and city systems.
- F. Manage and operate water supply facilities at the request of local government units.
- G. Act as the liaison between a regional supplier and all systems within the county. The county should be the sole buyer of water from the regional

supplier for resale to local systems.

- H. Act as liaison to any regional water resources board or agency established.
- I. Develop a plan for the transfer of unsatisfactory investor-owned systems to public ownership and operation and be prepared to take the operating responsibility.
- J. Integrate water supply facilities, sewage collection facilities and urban drainage facilities into a complementary and mutually supportive system on a county wide basis.

NEW YORK CITY

17. It is recommended that New York City become part of a new regional configuration so that its water supply needs can be met in a timely and equitable manner. (See recommendations 1 thru 5)

18. The city should immediately reexamine the present policy and operating procedures relating to the timing and volume of releases from its reservoirs in order to maintain reasonable environmental conditions consistent with water supply needs and local concerns. (See recommendation number 24)

CITIES, TOWNS AND VILLAGES

19. In order to take advantage of economies of scale, to improve service and to equalize water cost to consumers, all local governments should consider the consolidation of water supply and related services. Each town should consider the consolidation of existing and future districts into a single district or abolishing all districts and making water supply services a general town function.

20. Since water supply and wastewater disposal services are opposite sides of the same coin, the integrated development and operation of such services should be investigated by all local governments and implemented where feasible.

INVESTOR-OWNED

21. The further formation of private investor-owned water supply utilities or wastewater utilities should be prohibited after June 1, 1975, in southeastern New York.

22. Developers should be required to construct water supply, sewage, and drainage systems at their expense but the appropriate municipality should assume ownership and operational control of such facilities. All such systems should be in conformance with a town-wide and county-wide plan. Local governments should require the formal establishment of water, sewer and drainage districts or assessment areas for all new developments. Unsatisfactory and inadequate investor-owned water and sewer systems should be taken over by the appropriate municipality.

23. Regulatory efforts should be intensified to insure adequate service from small developer type water and sewer systems. The state should require that all

community water supply systems be sized to provide a fire protection capability.

ENVIRONMENTAL CONSIDERATIONS

ENVIRONMENTAL IMPACT

24. The New York State Department of Environmental Conservation should be given the authority and responsibility by the state legislature to establish the quality, timing and volume of releases below all water supply impoundments in the source and service areas of southeastern New York. This will make it possible to protect the public interest in maintaining viable streams below impoundments and preserve aesthetic, fish and wildlife and other values.

25. All water supply source development, water takings and waste water disposal projects must be evaluated as to environmental impact and developed and operated so as to minimize any adverse environmental effects. Such requirements should be structured into the water supply regulatory programs of the Departments of Health and Environmental Conservation.

EMERGING WATER SUPPLY TECHNOLOGY

DESALTING

26. Because of high costs, associated environmental impacts, and the lack of experience with large-scale desalting operations, desalting is not a viable alternative for public water supply in this region. To gain experience with large-scale operations a prototype desalting plant of 50 million gallons per day or more capacity should be constructed.

This plant should be totally funded by the federal government because of its experimental nature and of the national interest and implications. Such an experimental plant is essential to properly evaluate the economic, technical and environmental feasibility of large scale desalting operations in the northeastern portion of the United States.

WEATHER MODIFICATION

27. At the current time the reliability and efficiency of weather modification in this climate is too uncertain to be quantified and to be relied on for additional water in times of need. Controlled field experiments on the feasibility of weather modification in southeastern New York should be carried out jointly by the appropriate federal and state agencies. The State University Atmospheric Sciences Research Center is the appropriate agency to undertake such a program in cooperation with the Department of Environmental Conservation and federal agencies.

DIRECT WASTEWATER RECYCLING AND REUSE

28. Given the plentiful supply of high quality water available in this area, direct reuse of treated wastewater for drinking is an unacceptable and unnecessary risk due to the state of the art. Furthermore, it has serious

economic and technical drawbacks. The U.S. Environmental Protection Agency should expand research into advanced wastewater treatment and the needed controls to make direct recycling a safe reliable procedure.

INDIRECT REUSE-RECHARGE

29. Due to the critical nature of water supply in Nassau County, a recharge project should be developed and implemented providing for the recharge of treated wastewater into the groundwater through recharge basins and shallow wells. This should be a cooperative project carried out by federal, state, regional and county agencies.

PUBLIC POLICY FEDERAL, STATE & INTERSTATE ROLES

FEDERAL, STATE & INTERSTATE

30. All federal water resource programming in New York State should be carried out in close cooperation and as joint endeavors with the appropriate agencies of the State of New York.

31. The cooperative U.S.G.S.-State data collection and analysis programs should be continued and expanded where necessary. An expansion of the program is indicated for the Hudson River Basin and Long Island.

32. The final recommendations of the Federal Northeastern Water Supply Study (NEWS) should be closely coordinated and integrated with any state or regional planning proposals in order to make best use of the financial capabilities and water resources available to meet the water supply needs in the southeastern region.

33. In order to encourage conservation measures and universal metering in the southeast New York region, New York State should immediately commence action in cooperation with the Delaware River Basin Commission to eliminate the "excess release" requirements imposed on the City of New York.

34. The current application of the Department of Environmental Conservation to the Water Resources Council for financial assistance to develop a water resources management plan for the Hudson River Basin and Long Island is endorsed and supported.

35. Federal, interstate and state government roles in water supply should be restricted to research, data collections, planning, regulatory and financial assistance functions. All water supply services facilities design, construction, and operation should remain at the regional and local levels.

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FINAL LEGISLATIVE AND PROGRAM RECOMMENDATIONS

Temporary State Commission On The Water Supply Needs of Southeastern New York

Summary of Findings and Recommendations, 1975

During the past year, the Southeast Water Supply Commission sought the reactions of diverse parties of interest to the Commission's recommendations as set forth in early 1974. Central to these recommendations was a proposed regional corporation, a public authority device, to manage and develop regional water supply and to pursue conservation efforts.

FINDINGS

This feedback resulted in the following findings:

1. The authority device is generally held suspect throughout the region as beyond the control of existing jurisdictions.
2. The region is not ready for the major changes in the present web of governmental relations implied by creation of a comprehensive regional water supply agency. There is a particular concern in source areas over possible effects on local tax bases and revenues, and, on Long Island, over possible costs of a regional arrangement.
3. New York City adamantly opposes the proposed corporation and demonstrates little enthusiasm for major regional changes.
4. Many Mid-Hudson communities which are dependent on the New York City water supply system want a meaningful voice in regional water supply policy and management.
5. There is strong support for compulsory metering and conservation although New York City questions their value in the city.
6. There is general recognition of the need to develop additional water supplies.
7. There is concern over possible environmental and health impacts of the Commission's proposed Hudson River taking. There also is strong opposition to locking a new water supply agency into future expansion of Hinckley Reservoir north of Utica.
8. Some environmentalists believe that estimates of future needs are too high in light of latest demographic data.
9. New York City feels that estimated future needs are low, and that estimated savings from metering and conservation efforts are high.
10. There is strong support for requiring detailed environmental impact analysis

of all proposed new water supply developments.

11. There is general agreement on the need to establish better institutional control over reservoir release regiments.

12. There is strong support to provide for meaningful local input in the future formation of private water and sewer corporations.

13. There is concern over safeguarding the quality of present surface and groundwater supplies by appropriate action to protect watershed and recharge areas from contamination.

PROGRAM RECOMMENDATIONS

In response to these findings, the Commission supports the following legislative and program recommendations:

1. Compulsory universal metering in Southeastern New York.
2. Mandatory environmental assessments of new water supply sources and new works.
3. Establishment by the Department of Environmental Conservation of stream release schedules below water supply impoundments serving Southeastern New York.
4. Certification by county planning agencies of new private water and sewage works.
5. Creation of a self-supporting regional water supply corporation. This remains the preference of the Commission, although prospects for enactment are very dim. The corporation would take over existing regional water supply facilities, develop new facilities, and operate these in an integrated manner. New source development would be limited at this time to a Hudson River taking, following affirmative environmental and health assessments. The corporation's district would include New York City and the counties of Delaware, Dutchess, Nassau, Orange, Putnam, Rockland, Schoharie, Suffolk, Sullivan, Ulster and Westchester.
6. Creation of a state water supply agency. This appears to be a more acceptable and feasible alternative than the regional corporation proposal. This agency would become involved with new source development only. Such development would be limited at this time to a Hudson River taking, following affirmative environmental and health assessments. New regional facilities would have to be integrated with existing regional facilities, preferably by leasing operating responsibilities to New York City. The agency's district would include New York City, the counties of Westchester, Putnam and Dutchess, and, at their options, the counties of Ulster and Orange. Capital costs would be allocated among the City and counties.
7. Formation of councils of government for intermunicipal discussion of natural resource issues.

8. Elimination through negotiation under the sponsorship of the Delaware River Basin Commission of excess release requirements now imposed on the New York City system by Supreme Court decree.
9. Continued vigilance and pursuit of effective land use and waste disposal policies in order to prevent deterioration of existing water supplies.

LEGISLATIVE PROGRAM

The bills which have been drawn and constitute the legislative program of the Commission are:

A. SOUTHEASTERN NEW YORK WATER FACILITIES CORPORATION

Provides for a comprehensive regional water supply corporation (authority). Recognizing its small chances of passage, it is introduced for study purposes and for future reference.

B. SOUTHEASTERN WATER SUPPLY DEVELOPMENT AGENCY

Provides for a state regional water supply agency. It is the major recommendation of the Commission and the Commission's choice for immediate action.

C. UNIVERSAL WATER METERING

Provides for universal water metering in Southeastern New York.

D. ENVIRONMENTAL ASSESSMENT

Provides for environmental assessment of all new water supply source developments.

E. RELEASES FROM IMPOUNDMENTS, RESERVOIRS AND LAKES

Provides for the establishment of reasonable and responsive release schedules from water supply impoundments.

F. PRIVATE WATER AND SEWAGE WORKS

Provides for the certification by county planning agencies of new private water and sewage works.

G. COUNCIL OF GOVERNMENTS

Provides for the formation by counties and New York City of councils of government to discuss natural resource issues.

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Division of Water

DELAWARE-LOWER HUDSON REGION

WATER RESOURCES MANAGEMENT

STUDY

SEPTEMBER 1987

Prepared By

HAZEN AND SAWYER, P.C.

FOR

New York Department of Environmental Conservation

CHAPTER 6

FINDINGS AND CONCLUSIONS

6.1 Introduction

Careful planning is required to provide adequate supplies of water of sufficient quality for all uses, during both normal and drought conditions. This regional study provides the background and data needed to develop a regional strategy for water resource management.

Local, regional and state decision-makers must have adequate laws, policies and information to make the financial commitments and to develop the plans that will assure New York State residents of a continuing supply of high quality water. To aid in this process, the major findings and conclusions regarding the water resources in the Delaware-Lower Hudson Region are summarized in this chapter.

The findings and conclusions are derived from factual data collected from individual municipal water supply systems, and estimates for water demand by agricultural users and self-supplied industries. The findings and conclusions characterize the region's water supply in these respects: population served and the present and projected demand; the present and projected capacity; known or anticipated water quality problems; extent and cost of repairs or expansion needed in the infrastructure; aspects of system management, and identification of areas where there is insufficient information.

The findings and conclusions are separated into six sections: quantity, quality, system management, regionalization, water system improvements and data and research needs. The special needs of small systems and the New York City System are addressed in the section on system management.

6.2 Water Quantity

6.2.1 Surface Water Resources

Findings

1. The Delaware-Lower Hudson Region has an abundance of undeveloped surface water.
2. The New York City System, serving over 8 million people in New York City, Westchester, Putnam, Orange, and Ulster Counties, supplies an average of over 1.5 billion gallons of water each day from surface sources.
3. Nearly all of the large water supply systems in the region (those serving more than 5000 people) obtain water from surface sources.
4. The Hudson River is the major surface source within the region capable of being developed to supply most of the demand deficit of the New York City System.

Conclusions

1. The Hudson River should be considered a primary source of additional supply for the New York City System, as well as the up-state counties, particularly Dutchess and Ulster.

6.2.2 Groundwater

Findings

1. Groundwater serves many small communities, self-supplied industries, agriculture, institutions and private domestic supplies.
2. Groundwater is generally of good quality and requires less treatment than surface sources.
3. Groundwater yields in the region are generally sufficient for small communities but must be properly managed.
4. The Brooklyn/Queens aquifer until recently supplied almost half a million people and an average daily demand of 50 mgd for public water supply purposes. (In 1986, the pumpage was less than 40 mgd because more City water was supplied to JWSC-Q.) The aquifer has been stressed due to overpumping in the past and there have been problems with water quality. The aquifer is part of the extensive Long Island aquifer which supplies Nassau and Suffolk Counties.

Conclusions

1. Groundwater will continue to be a viable source for small water systems.
2. Groundwater management plans should be adopted in areas where communities depend on groundwater to insure both sustained yields and good quality.
3. The Long Island Groundwater Management Plan should be implemented to make best use of the resource and eliminate problems due to overpumping and contamination.

6.2.3 Supply-Demand Balance

Findings

1. The current New York City System water supply deficit is real as demonstrated by the recent water shortages experienced in 1980 and 1984-85.
2. The current deficit is between 200 and 300 mgd. The present estimate of the safe yield of the New York City System upland reservoir supply, 1290 mgd, is less than the recent (1986) 1556 mgd demand of all System users including the full demand of JWSC-Queens.

3. It will be 10 years before the full effectiveness of universal metering in reducing demands can be determined. Even with maximum conservation a New York City System deficit of 200 to 300 mgd is expected in the year 2000 as the effects of conservation may be offset by growth in demand.
4. Under the 1905 Water Supply Act, New York City must supply municipalities and water districts in counties in which City System facilities are located. New demands unanticipated by the current comprehensive planning process may have to be satisfied by the New York City System.
5. The New York City System water supply deficit is projected at between 300 and 800 mgd for the year 2030, even with savings achieved through conservation. Estimates of the deficit will be refined based on the results of the current detailed demand study of the City System. The actual deficit will depend upon growth rates, effectiveness of conservation measures, refinement of safe yield estimates, etc.
6. Many small systems, particularly in Sullivan County, have high seasonal variations in demand and require additional sources to meet these demands.
7. Many small systems are unable to interconnect with other systems due to geographic constraints and must maintain auxiliary sources as emergency supplies. These sources are often abandoned surface sources and are unreliable, of poor quality, or threatened by pollution.
8. Many systems that are currently facing system deficits also have high unaccounted for water losses.
9. Some systems in the region have excess capacity.

Conclusions

1. A new supplemental supply or supplies with a safe yield of from 200 mgd to 300 mgd is required for the present New York City System deficit. Supplies with a safe yield of from 300 mgd to 800 mgd may be required to meet the long-term deficits of the System. Because of the uncertainty of the deficits and the many years of lead time required to acquire land and address environmental concerns, it is recommended that planning for supplemental Hudson River supply projects be initiated as soon as possible.
2. Systems with supply deficits and high unaccounted for water losses should make efforts to identify demand and establish conservation programs before developing new sources of supply.
3. Additional sources should be developed for those systems which are experiencing shortages.

4. Those systems which require auxiliary sources to meet peak seasonal demands must insure that an adequate quantity of high quality water is available.
5. Conservation programs should be implemented by all communities in the region to reduce demand.
6. Where feasible, local excess capacities should be made available to other systems or used to stimulate economic development.

6.2.4 Interconnections

Findings

1. Many water systems are interconnected, especially in Westchester and Rockland Counties, where the City System and the Spring Valley Water Company, respectively, serve as regional supplies.
2. Many small systems are isolated by distance and geography, making interconnections impractical, as is the case in Delaware County.
3. Although some systems are interconnected, condition and carrying capacity of these interconnections are generally unknown.
4. Interconnections provide a means for emergency supply, for utilization of surplus supplies, and for avoiding unnecessary duplications in service.
5. The New York City service agreement with customers stipulates that the City reserves the right to shut down an aqueduct for maintenance or under emergency conditions, making interconnections with systems served by local sources or another City aqueduct a necessity.

Conclusions

1. More systems should be encouraged to interconnect where feasible. Regular operation of key system emergency interconnections should be required by New York State.
2. For systems connected to the New York City System, interconnections with systems served by local supplies or another City aqueduct should be investigated to provide back-up service during aqueduct shut-down.

6.2.5 Regulation of Withdrawals

Findings

1. Large self-supplied industrial, commercial and institutional users presently are not required to obtain water withdrawal permits from the DEC or to report withdrawal and consumption. There is potential for local water use conflicts.

Conclusions

1. Surface and groundwater resources must be managed effectively to meet water supply needs while protecting the resource. Permits should be required for all large water withdrawals. All withdrawals by self-supplied users should be metered and reported to New York State.

6.3 Water Quality

Findings

1. Many small systems use sources located close to the municipality due to the high cost of transmission facilities. This leaves the sources vulnerable to contamination from activities such as oil spills, contamination from gasoline stations and road salts.
2. Many systems do not have watershed rules and regulations or their regulations are not up to date. It is difficult to enact and enforce watershed rules and regulations for developed land.
3. Water quality in the region is generally good. Groundwater usually only requires disinfection. Under the proposed SWTR to be promulgated by USEPA by December, 1987, surface waters will require filtration unless they meet certain proposed water quality criteria. If the criteria is met, the States are empowered to grant "exceptions" to the filtration requirement.
4. There are several surface and groundwater sources in the region that are threatened by potential contamination.
5. The Brooklyn - Queens aquifer has localized contamination resulting from salt water intrusion and surface contaminants. Localized overdraft of the aquifer has exacerbated contamination conditions.
6. Many systems suffer economic hardships when sources require additional treatment. Some municipalities have chosen to develop new sources instead of treating existing supplies.
7. The single largest influence on water quantity in the lower Hudson is the downstream release from reservoirs in the upper Hudson River, particularly Sacandaga Reservoir.

Conclusions

1. Communities should update their watershed rules and regulations to protect the quality of their sources.
2. Communities with a poor quality groundwater source or unfiltered surface water sources of marginal quality which do not meet SWTR criteria, must either acquire new sources or upgrade their treatment.

3. Communities with an unfiltered surface water source of high quality should perform the necessary analyses to demonstrate to the State DOH that the water meets the criteria under which an "exception" from filtration can be secured from DOH. Even if the communities are not inclined to seek an "exception", the accumulation of the water quality data is advisable.
4. The Long Island and Upstate Groundwater Management Plans should be implemented to make best use of the resource, to eliminate problems due to overpumping, and to establish regional, basin wide protection from contamination.
5. Regional or basin-wide planning should be undertaken for the Hudson River Basin to insure that proper water quality and quantity is maintained.

6.4 System Management

6.4.1 Revenues

Findings

1. Lack of knowledge by local government officials and the public of water resource issues, technical requirements of the water systems, and the true costs of providing water service have been identified as a major difficulty for water system superintendents in obtaining budgets to respond to system needs.
2. Water system superintendents have identified two areas of governmental interaction which frequently restrict their ability to fund capital improvement or distribution system maintenance. First, water system revenues may be subject to arbitrary transfer to the general municipal fund, thus reducing their ability to maintain their systems with their own rate structures.

Secondly, water districts are ineligible by state requirements to accumulate capital reserve funds, thus reducing their ability to plan and set aside funds for capital improvements.

Conclusions

1. There is a need to educate local officials and the public on all aspects of water resource and water supply system management. The practice of allowing transfers of water revenues from the water system budget to the general fund beyond reasonable fees for rental space, use of municipal equipment and facilities, administrative overhead, etc., can be detrimental to the water systems and should not be condoned. Water rates based on the true cost of providing service should be established.
2. The State should consider alternative financing methods such as a capital revolving fund to provide loans to municipalities. The State should consider amending any regulations or laws

inhibiting municipalities from accumulating a reasonable reserve fund for water system capital improvements.

6.4.2 Metering

Findings

1. Of the water supply systems surveyed in the region, 90% have all or nearly all of their services metered. The systems that are not metered or only partially metered include New York City and account for about 87% of the total regional municipal demand.
2. Many systems, although metered, do not use their metering information as a management tool to identify unaccounted for water, to plan system improvements, and to monitor consumption.
3. Some systems are not metered and, as a result, identifying unaccounted-for-water and planning for improvements is difficult.
4. New York City is committed to a universal metering program.

Conclusions

1. Metering is an important tool, providing information that is essential for proper management and planning. Metering data should be made available to system managers and operators, and used to evaluate demands and monitor the effects of conservation measures. All water systems in the region should be encouraged to meter all connections.
2. All water systems should be encouraged to meter all connections.

6.4.3 Water Conservation

Findings

1. New York City has developed a water conservation plan in an effort to reduce consumption and reduce the amount of water which is required from a new supply source.

To this end the City has initiated an ongoing leak detection program which has proven to be effective, legislation which requires the installation of water saving fixtures in new construction and rehabilitation work, and a ten year program for metering universally. Additional incentive to conserve will arise from the rate restructuring necessary to finance the City's Water Supply Capital Improvement Program.

2. It could take up to 10 years for conservation programs to be implemented and to be significantly effective.

3. For all systems which draw more than 100,000 gallons per day from the Delaware Basin, the Delaware River Basin Commission has adopted a resolution to require source and service metering, leak detection and conservation basin-wide.
4. Only a small number of systems have developed long range water conservation programs and drought contingency plans.

Conclusions

1. There is a need to develop programs for insuring that water systems develop drought contingency plans and water conservation programs.
2. Water systems, especially those that are currently considering developing new sources to increase supply, should develop conservation programs to reduce demand.
3. Consideration should be given to requiring major water suppliers (serving more than 5,000 people) to prepare water management plans. Each plan should include a program for improvement and development of sources and facilities to meet projected demands; a contingency plan, especially a drought emergency plan; and an active leak control and water conservation program.

6.4.4 Small Systems

Findings

1. There are 342 municipal water supply systems in the region that have service populations of less than 5000 people. These small systems represent 88% of the total number of municipal water supply systems, but they only serve 3% of the region's population.
2. Quantity and Quality: The majority of small systems in the region use wells. Water quality is generally good, with chlorine disinfection being the only treatment method. Some systems have disinfection waivers based on a history of satisfactory bacteriological analyses of the raw water samples. Due to the high cost of transmission facilities small systems often look for sources close to home. But because of their proximity, these sources can be vulnerable to local contamination. The best sources are developed first, and if these become polluted or are unable to produce sufficient quantities, municipalities must provide additional treatment or develop new sources.

Water treatment technologies are available today to remove a wide range of water pollutants, but these technologies have not always been scaled down to a size and price that is appropriate for small systems. When faced with quality problems, purveyors often find alternatives expensive.

3. Infrastructure problems: Once water pipes are buried they are easily forgotten. Leaks eventually develop and often go undetected, and a large amount of water may be lost. Some systems do not have adequate metering facilities so it is difficult to determine consumption or system losses. Municipalities are often reluctant to spend money for regular maintenance.

As a result systems are sometimes neglected until disruptions in service occur and major repairs are necessary (these coming at high capital costs). In all areas of the region, municipalities reported that their distribution systems were in the greatest need of attention. Many water mains are now 50 to 100 years old and in need of major repairs, cleaning, or replacement. The amount of storage in small systems should be based on the maximum and daily flow demands, fire flow needs, and the likelihood of treatment plant or source failure. Storage in small systems is often adequate for peak flows, but not for fire flows. Construction of additional storage may be expensive for small municipalities.

4. Management problems: Small systems are often run by part-time operators who are not properly trained and do not have the technical resources available to properly operate and maintain a system. As a result, the systems are often neglected and fall into disrepair.

Some areas have experienced problems with private owners who have neglected their systems or abandoned them altogether. In Sullivan County, one private system has accumulated several health violations. Another has been taken to court. In both cases the towns are trying to obtain funding to purchase the systems. It is more difficult for small systems to finance capital improvements. Small systems do not profit from economies of scale, or have the customer base to finance substantial capital improvements.

Conclusions

1. New York State should consider the special needs of small water systems by enacting and implementing legislation to enable these systems to finance necessary improvements.
2. At times a private water system owner is unable or unwilling to bring its water supply system up to the standards necessary to ensure public health and safety. The State should offer assistance in the acquisition of the system by the most suitable local entity.
3. Metering is an important tool for management and planning. Small systems should be encouraged to install meters and abandon flat rate charges.

4. Operators must be properly trained.
5. Small systems should consider forming institutional groups which could share technical and managerial resources. They should also take advantage of information and help available through the American Water Works Association, the Rural Water Association, and the State.
6. New York State should consider expanding the statewide program for small water systems to provide additional technical assistance and alternative means of financing improvements.

6.4.5 Planning for Additional Regional Water Supply

Findings

1. A supplemental supply of an additional 200 mgd to 300 mgd is needed now. The most feasible alternative for this near term supply addition is expansion of the existing Chelsea Pump Station and/or development of a new supplemental supply at an alternative site such as Kingston or Newburgh on the Hudson River.
2. Development of a 300 mgd to 800 mgd supply will require many years of lead time to acquire land and address environmental concerns. The implementation time for a project or projects supplying more than 300 mgd is estimated to be up to 30 years. The City must identify a long-term option so that it is prepared to implement a viable program if the need arises. The most feasible source of supply to meet a demand deficit in excess of 300 mgd is the Hudson River. The Hudson River could be developed to meet this deficit by skimming high-flows; by augmenting low-flows in the river with diversions from other basins (such as the Great Lakes); or with releases from new or re-regulated reservoirs within the Upper Hudson River watershed.

Chelsea Pump Station

3. Expansion of the Chelsea Pump Station from a 100 mgd emergency supply to a 200 to 300 mgd permanent supplemental supply should have a shorter review time than other Hudson River alternatives because of the history of emergency withdrawals at this point. However, at these rates of withdrawal, it can be expected that filtration of all water withdrawn will be required.
4. Expansion at the Chelsea site to provide intake, pumping and filtration facilities with a total capacity of 200 to 300 mgd will be difficult because of site restrictions, high pressures at the Delaware Aqueduct connection and the likelihood of an Aqueduct shut-down for an extended period of time to make the connection.

5. It has not been confirmed that it is feasible to withdraw up to 300 mgd continuously at the Chelsea site without impacting other upstream users. Additional studies may be needed to determine (1) salt front migration, (2) the chloride and sodium content in the blended Hudson River/Delaware Aqueduct supply, and (3) the actual safe yield that could be realized from a 200 to 300 mgd installation subject to any restrictions that may be imposed on pumping during low river flows.

Brooklyn/Queens Aquifer

6. The yield of the Brooklyn-Queens aquifer has been estimated at about 100 mgd using the existing Jamaica Water Supply Company-Queens franchise area wells and properly located new well fields.

On an intermittent basis, a pumpage of 200 mgd could be maintained for almost eleven months assuming that the wells are rested for a period of at least six years with natural recharge or 3 years with artificial recharge. Additional studies are needed to a certain the quality and quantity of water available from this source.

Hudson River Supply Alternatives

7. Any Hudson River project must operate in conjunction with the New York City System of reservoirs and conveyances. Under historic drought conditions, there is sufficient excess capacity available to receive and convey a supplemental flow of up to 310 mgd in the Delaware Aqueduct, and up to 440 mgd in the Delaware and Catskill Aqueducts together before the construction of major additions must be considered.
8. The salt front (defined as 50 mg/l of chloride) rarely reaches Poughkeepsie (roughly river mile 77) in the fall and is normally pressed back below the Tappan Zee Bridge (about river mile 8) by early spring. Flows necessary to maintain the salt front below the Poughkeepsie intake are normally available in all except two or three months of the most severe drought. Upstream saline intrusion is stemmed by downstream flows from natural drainage and reservoir releases.
9. Saline intrusion, particularly during drought episodes, limits the amount of water which may be withdrawn from the Hudson River. Existing modeling efforts conflict as to the magnitude of water which may be withdrawn on a year-round basis, and the associated impacts of water quality at the point of withdrawal and at the existing treatment plants in Dutchess and Ulster Counties. Additional modeling must be done before the most feasible Hudson River project can be selected.
10. The most cost effective alternative will usually utilize the existing system capacity before new construction. Supply

additions must be chosen carefully so that the chosen alternative does not limit the system capacity or inhibit economical future supply additions.

Conclusions

1. Continue preliminary engineering planning for the development of the existing Chelsea and alternative sites to determine the maximum potential capacity of the facilities acting as a supplemental supply and utilizing existing aqueducts. The planning should include provision for filtration of all water drawn from the Hudson River. As soon as possible, a maximum practical pumping/treatment rate should be established taking into account site constraints, connections to and capacities of the existing City aqueducts, etc. Based on feasibility studies to date, it is expected that the maximum rate will be between 200 and 300 mgd.
2. Initiate detailed studies of the impact of continuous and nearly continuous (say ten to eleven months per year) withdrawals at Chelsea and alternative sites covering such topics as the salt front, chloride and sodium content of the blended supplies, anticipated safe yields of the supplemental supplies, effect of withdrawals on other systems using the Hudson River, etc. The studies should cover a range of withdrawal rates corresponding to the same range indicated in 1 above or about 200 to 300 mgd.
3. If the current detailed water demand study indicates that the projected 2030 supply deficit is close to the low end of the present estimated range of 300 to 800 mgd and the studies recommended in land 2 above conclude that a supplemental supply yielding 200 to 300 mgd can be developed at Chelsea or an alternative site, the supplemental supply should be implemented as quickly as possible. If there is a significant disparity between the projected 2030 deficit and the maximum safe yield that can be developed at Chelsea or an alternative site, it will be necessary to consider a larger Hudson River project as discussed hereinafter.
4. Long-term planning for an additional major water supply on the order of 600 to 800 mgd should be initiated now and be completed simultaneously with the studies recommended in 1 and 2 above. The results of this planning will provide the City with the necessary engineering, financial and environmental analyses in the event it is determined that a 200 to 300 mgd supplemental supply is not adequate for future demands. The long-term planning studies should include alternative high flow skimming of the Hudson River and the possibility of dual-purpose treatment facilities for both the Hudson River and the Catskill/Delaware supplies.
5. The City should participate in regional or basin-wide planning of the Hudson River. Options to provide long-term water needs which have been inhibited or prohibited by legislation (such as the re-regulation of Sacandaga Reservoir, or construction of the

Gooley reservoir) may be re-investigated within the context of regional or basin-wide planning.

6.4.6 Regionalization

Findings

1. The New York City System serves about 85% of the population of the Delaware - Lower Hudson Region and can be considered a regional supply. This regional aspect of the City System will grow in the future as some existing and new upstate water systems seek supplies from the existing New York City supply facilities or from future additions to the City System.
2. There are competing demands for the use of the Hudson River as a water supply. In addition to withdrawals by industries and existing municipal water systems, future demands by the New York City System and upstate communities, acting alone or through the City System, may increase the development of this source.
3. Nearly all public water supply in Rockland County is by the Spring Valley Water Company. With the exception of Slootsburg, the three remaining public systems have interconnections with the Spring Valley Water Company System.
4. There are areas within the region where water systems could join together to form part-county or county-wide water districts to take advantage of economies of scale, avoid unnecessary duplication of service, and make best use of local resources. An example of this regional approach is the Orange County Water Authority, formed in 1987, to develop both local supplies and a connection to the New York City System. Other areas such as Dutchess County will probably have to create similar part-county or county-wide districts or authorities to serve growing populations.
5. Under the 1905 Water Supply Act, the City of New York imposes per capita limitations on the amount of water supplied to each municipality and local water district based upon the Census population of that municipality or district. A number of the upstate counties have indicated that they would like to see legislative changes to permit part-county (encompassing two or more municipalities) or county-wide districts to use the broadest possible population base in determining per capita use rather than on an individual municipal basis.

Conclusions

1. For those areas located at some distance from the New York City System, county-wide water agencies could have primary responsibility for procuring sufficient quantities of good quality water to supply wholesale to various water systems. The source could be the City System and/or local sources. They could provide technical help to small water systems on their operations and in developing water conservation plans.

2. A regional institutional framework should be explored to help manage long-term supply requirements within the Hudson River Basin. This is particularly important in view of the need to develop an additional supply from the Hudson River to meet the combined needs of New York City and the upstate counties.
3. The possibility of further expansion of the New York City System to accommodate regional growth pressures should be explored. This might provide the opportunity for efficient and economical distribution of water to communities not currently served by the New York City System. The 1905 legislation should be reviewed to determine if new legislation is needed to facilitate development of new sources that may be beneficial to both the City and the upstate counties. The review should also consider the per capita problem described in Finding 5.
4. Sloatsburg, in Rockland County, should interconnect with the Spring Valley Water Company.

6.5. System Infrastructure Improvements

Findings

1. There is a significant need for improvements to the existing water system facilities in the Delaware-Lower Hudson Region. The total estimated cost for infrastructure improvements in the region is \$ 6.63 billion. (This cost does not include the development of new sources beyond the expansion of the Chelsea Pumping Station.) The costs are summarized in thousands of dollars in Table 1-1.
2. Many of the older systems in the region are experiencing problems with their distribution systems. These systems contain water mains installed prior to the 1940's, most of which are unlined, cast iron pipe. This type of pipe is subject to tuberculation, which decreases the carrying capacity of the pipe and creates "dirty" water problems.
3. Many systems are in need of additional storage facilities to meet demand and fire protection requirements.
4. Many systems do not have routine maintenance programs and have deteriorated to the point where major repairs are necessary to insure continued service with adequate quantity and quality and at adequate pressure. Often, systems are neglected until disruptions in service occur and major repairs are necessary to resume service.
5. There is a lack of engineering studies and planning for water systems in the region.
6. Some communities have distribution system maintenance programs that have shown good results.

Conclusions

1. Water system improvements and routine maintenance programs should be started as soon as possible.
2. Engineering studies and planning should be initiated to identify needs and schedule improvements.

6.6. Data and Research

Findings

1. Data on the safe yield of surface and ground water resources needs clarification. There is not enough data presently available to determine accurately the amount of water that is available.
2. Information is especially limited on groundwater aquifer yields.
3. Information on supply yield, system design or water use is not available for most small water systems in the region.
4. Information on large, self-supplied industries and agriculture is not readily available.
5. Information on the amount of water withdrawn, production, consumption and unaccounted-for water loss is not available for all public water systems due to insufficient metering and record keeping.
6. Metering information is not always regularly monitored and made available for management of a public water system.
7. Without regular monitoring of service meter flow information, consumption by user category can not be defined and used as a tool for projecting future water demand and developing water conservation programs. Except in areas where recent detailed engineering studies had made more detailed projections, water demand projections could only be made on a per capita basis.
8. Comparison of cost projections for the alternative Hudson River Projects proposed in past studies is difficult in terms of cost per mgd of safe yield provided. Significant differences exist between alternative projects: some projects address a need for regional conveyance to Long Island or to New Jersey; flood skimming as opposed to continuous withdrawal; the capacity of the existing reservoir-conveyance system; or flexibility for future expansion.
9. The Hudson River is the major potential surface source of additional supply for New York City System. Additional demand, engineering, environmental and hydrologic studies are required before a long-range supply project can be selected.

10. Information on the present consumption of water by different categories of users is limited for New York City and as a result, predicting future demands on the New York City System is difficult.
11. Additional information on the capacity of the existing New York City aqueduct - conveyance system is required before selecting a major supplemental supply.
12. Additional engineering and environmental studies will be necessary to determine the feasibility of using the Brooklyn-Queens aquifer as part of a regional water supply system.

Conclusions

1. Effective management of water resources and water supply systems in the region requires comprehensive data on the location, safe yield, quality, condition and present uses of the systems and the resources. The State should require regular monitoring of water resources and water supply systems.
2. A detailed hydrologic study of the Hudson River should be undertaken, including but not limited to sources of flow, alternative management schemes for reservoir releases and diversions. A basin-wide water balance of supply and demands should be considered.
3. Additional environmental assessments must be made before a Hudson River project can be selected. Such assessment should include but not be limited to: salinity modeling to discern the impacts of Hudson River withdrawals on upstream users and the maximum year-round Hudson River withdrawals possible, the magnitude of downstream releases required for the various supplies of the New York City System, effectiveness of basin-wide management, the impacts on fisheries resources within the Hudson River and the downstream City Reservoirs for withdrawals from the alternative Hudson River intake locations.
4. A detailed demand study is necessary to determine the present use of water by various categories of users and to permit better prediction of the future demands on the New York City System. This study is currently underway.
5. Hydrologic simulations of the existing aqueduct-conveyance system are needed to assess existing capacity, flexibility for future expansion and supplemental needs.
6. Development of a supplemental supply for New York City System will require additional engineering analyses before a project can be selected. Due to the long lead-in time necessary for such a major project, the studies should begin as soon as possible.

7. Additional study is necessary to determine water quality suitability of the Brooklyn/Queens aquifer if subject to pumping under intermittent stress conditions during droughts.